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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/071,144	02/06/2002	Jun-Fei Zheng	042390P7480D	4135

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EXAMINER

LE, DUNG ANH

ART UNIT PAPER NUMBER

2818

DATE MAILED: 09/06/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/071,144

Applicant(s)

ZHENG ET AL.

Examiner

DUNG A LE

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on 01 July 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) 6-9 and 14-26 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) _____ is/are rejected.
- 7) ☐ Claim(s) 5 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 06 February 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Oath/Declaration

The oath/declaration filed on 2/6/2002 is acceptable.

Election/Restriction

Application's election without traverse of Group II (Claims 1-5, 10-13) in Paper No. 5, drawn to process of making a semiconductor device is acknowledged for prosecution in the subject application. Applicants have the right to file a divisional, continuation or continuation-in-part application covering the subject matter of the non-elected claims 14-17.

Information Disclosure Statement

This office acknowledges of the following items from the Applicant:

Information Disclosure Statement (IDS) filed on 2/6/2002 and made of record as Paper No. 2. The references cited on the PTOL 1449 form have been considered.

Specification

The specification is objected to for the following reasons:

The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed (see MPEP § 606.01).

A new abstract is required that is clearly indicative the invention to which the claims are directed. Note that, the claims are directed to a method of making a semiconductor device instead of to a semiconductor device.

The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required: Claim 13, "the first critical thickness is approximately 20 angstroms and the second critical thickness is approximately 100 angstroms." is failed to provide proper antecedent basis for the claimed subject matter.

The specification has been checked to the extent necessary to determine the presence of all possible minor errors. However, the applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections

Claim Rejections - 35 USC § 112

Claims 10 is rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The limitation in claim 10, "a first thickness" and "a second thickness" are vague and indefinite. It is not clear which thickness is desired for each one.

The remaining claims are dependent from the above rejected claims and therefore also considered indefinite.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-4 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Yeom et al. (6091120 / IDS).

Yeom et al. disclose a method of forming a gate electrode, comprising:

forming a first layer 8 of a first material (Titanium Nitride) having a first work function on a substrate (col 4, line 57);

forming a second layer 10 of a second material over the first layer, the second material having a second work function (col 4, lines 63-67); and

removing a portion of the first and second layers (figs. 3-4);

Yeom et al. do not disclose a stack formed by the first and second layers has a work function that is between the first work function and the second work function.

Yeom et al. teach that it is known to provide thermal stability and a

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good work function, it has been proposed to form a multilayer gate electrode including a first conductive layer of a metal nitride film such as titanium nitride (TiN) and a second conductive layer comprising a low resistance metal layer, on the first conductive layer. The low resistance metal layer may be, for example, a metal film comprising tungsten (W), titanium (Ti), titanium disilicide (TiSi.sub.2) or copper (Cu) as set forth in column 2, lines 33-42.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to form a stack having the first and second layers has a work function that is between the first work function and the second work function in order to obtain a best device having the different metal layers with different work functions, and this results in different threshold voltages or operating voltages for devices formed from the different metals, additionally, this variation in threshold or operating voltage provide additional flexibility to circuit designers.

Regarding claims 2 and 3, the substrate 2 is a silicon wafer with an insulating layer 4 formed thereon and the insulating layer comprises an oxide of silicon (fig. 2, col 4, lines 52-53).

Regarding claim 4, the second layer 10 is substantially thicker than the first layer 8 (fig. 3).

Allowable Subject Matter

Claim 5 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims, since the prior made of record and considered pertinent to the applicant's disclosure does not teach or suggest the claimed limitations. Yeom et al. (U.S. Patent No. 6091120), taken individually or in combination, do not teach the claimed invention having the step of providing an optimal channel doping for a predetermined relationship between an on current, I_{on} , and an off current, I_{off} (Regarding claim 5).

When responding to the office action, Applicants' are advice to provide the examiner with the line numbers and page numbers in the application and/or references cited to assist the examiner to locate the appropriate paragraphs.

A shortened statutory period for response to this action is set to expire 3 (three) months and 0 (zero) day from the day of this letter. Failure to respond within the period for response will cause the application to become abandoned (see M.P.E.P 710.02(b)).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dung A. Le whose telephone number is 703-306-5797. The examiner can normally be reached on Monday-Friday 8:00am-5: 30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Nelms can be reached on 703-308-4910. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Dung A. Le *DL*

Date: *9-02*

Dung A. Le *DL*

Examiner

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